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(54) Abrading member

(57) An abrading member particularly suited to grinding and smoothing lenses is in the form of a flexible pad.

The pad may be a slotted disc which is flat on one side for attachment to a tool. The other side may be formed with spaced, upstanding projections, the ends of which act as operative abrading surfaces, or perforations may be made in the member. Abrasive particles are incorporated into the pad which is formed of plastics material.

The pad is made by injection moulding a mixture of plastics material and abrasive particles in a mould of the required shape.

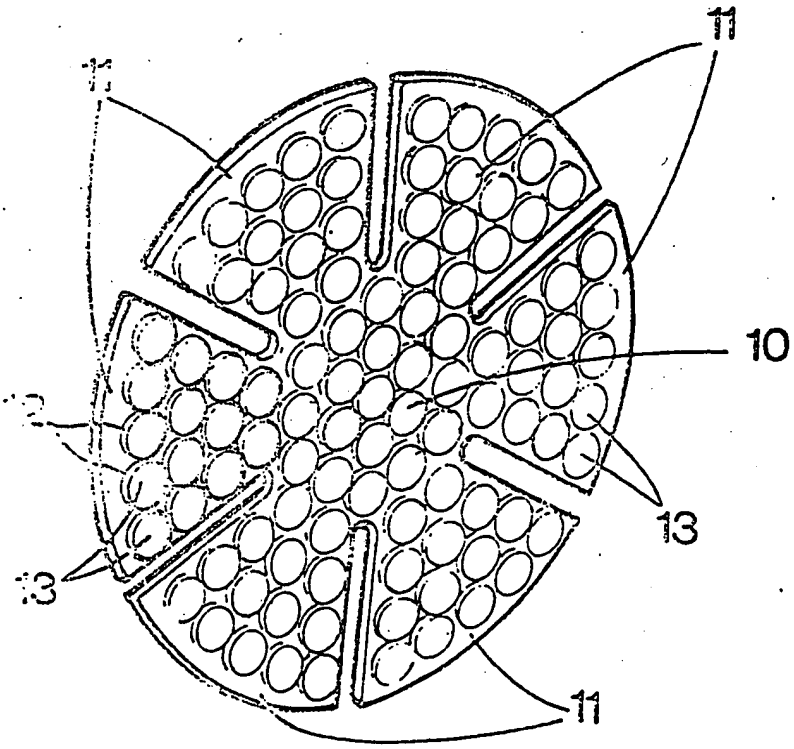

FIG. 1

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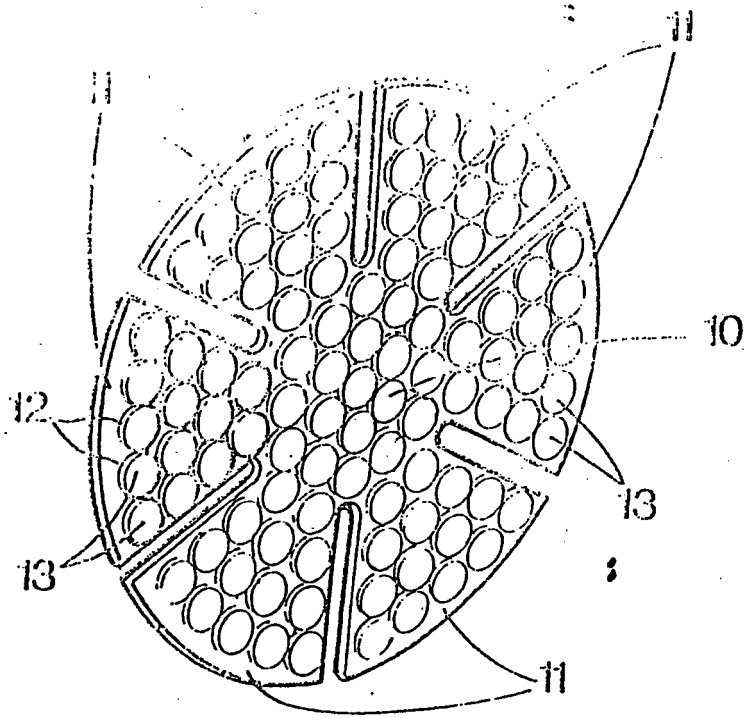

FIG. 1

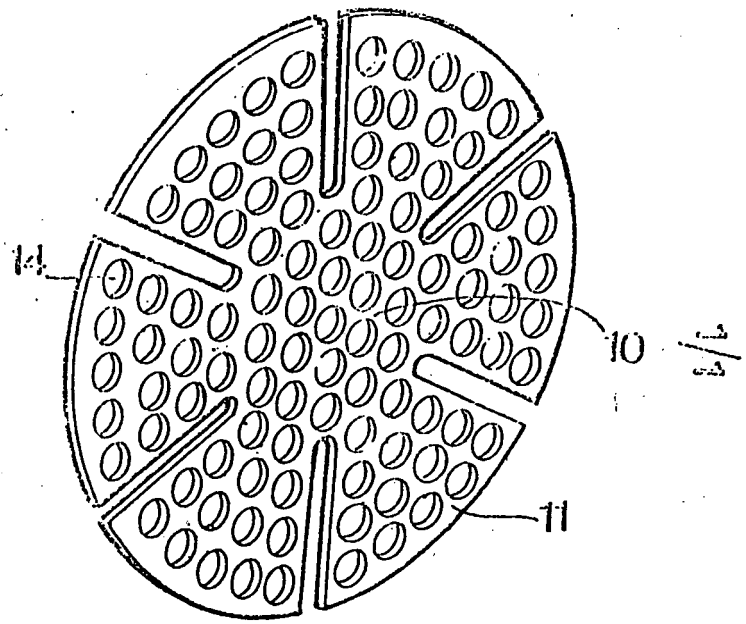

FIG. 2

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SPECIFICATION

Abrading member

This invention relates to abrading members and in particular to abrading tools for grinding, smoothing and performing other operations on glass and other materials. For example, the invention should find application in grinding lenses.

In lens grinding a tool having the desired curvature of the lens is often used and an abrasive slurry is passed over the surface of the tool in contact with the lens blank while the blank is moved relative to the tool. The resulting abrasive action grinds the blank to the desired curvature corresponding to that of the tool. In this arrangement the tool is subject to wear and has to be brought back to its original form from time to time.

Alternatives to the described lens grinding tool have been proposed by way of applying a replaceable pad between the tool and the lens but hitherto such pads have had a short working life and it has been difficult to obtain an accurately shaped surface for the pad.

A further alternative has been to apply a plurality of small abrading members or pellets to the surface of a tool but it is difficult to adhere the members to the surface and to position them accurately.

In G.B. Patent 1,375,371 it has also been proposed to provide an abrading member in which spaced areas of a mesh sheet carry abrasive particles.

An object of the present invention is to provide an abrading member which is flexible, has a long life and is capable of being accurately located on a tool.

According to one aspect of the invention an abrading member comprises flexible plastics material in which is dispersed abrasive particles, the member having one face with an operative surface at which abrasive particles are located, and the plastics material being homogeneous.

Preferably the operative surface constitutes only a part of the area of said one face. In one arrangement said operative surface is constituted by the outer ends of a plurality of projections upstanding from said one face. In another arrangement the operative surface is constituted by said one face which is a plain surface in which there are formed a plurality of perforations. Conveniently the area of the operative surface is in the range 30–50% of the total area of said one face.

According to another aspect of the invention in a process for forming an abrading member, plastics moulding material and abrasive particles are intermixed, the mixture is placed in a mould and the mould is heated to injection mould the material to the desired shape with the particles dispersed in the material.

According to a further aspect of the invention an abrading member comprises flexible material in which is dispersed abrasive particles, the flexible material being formed with one face of the material having a plurality of upstanding projections, the outer ends of which act as an operative surface of the member and abrasive particles being located at said operative surface. Preferably the projections are each of circular section and have a flat outer end constituting an operative surface.

According to a still further aspect of the invention an abrading member comprises flexible material in which is dispersed abrasive particles, the flexible material having one face defining an operative surface of the member in which perforations or depressions are formed, abrasive particles being located at said operative surface.

For lens grinding the abrading member may be of overall disc-like form with part-segmental portions radiating from a central portion, each portion or only the segmental portions being formed with said upstanding projections or perforations.

In use the abrading member is bonded or otherwise located on a tool of the desired form, the flexibility of the member causing it to conform in shape to the tool and the operative surface facing away from the tool.

Further features of the invention appear from the following description of two embodiments of the invention, suitable for lens grinding, give by way of example and with reference to the drawings in which:

Figure 1 is a perspective view of one form of abrading member having projections, and

Figure 2 is a perspective view of another form of abrading member having perforations.

Referring to the drawings, two forms of abrading member are shown, each formed of synthetic flexible plastics material, such as nylon, polypropylene, polyurethane or styrene-acrylonitrile, incorporating abrasive material such as diamond, cubic-boronitride, carborundum or man-made abrasives. The plastics material is coloured according to the grade of abrasive used.

The members are each pads of generally disc-like form having a central circular portion 10 from which extend integral, radially-directed part-segmental portions 11, the number and extent of which are variable. In Fig. 1 one face of each of the portions 10 and 11 is formed integrally with upstanding circular projections 12 spaced from one another over the member and having flat outer ends 13. In Fig. 2 the projections 12 are replaced by circular perforations 14 extending through the pad from one side to the other, or only part way through the pad in which case they may be termed depressions.

The size, shape and length of the radially directed slots between the portions 11 can be

varied to give the desired degree of flexibility of the member.

Although in the drawings the projections 12 and perforations 14 are shown in symmetrical pattern, they may be in a random arrangement and this gives advantages in some applications. Moreover, the projections 12 or perforations 14 in the central circular portion 10 can be omitted, and the projections or perforations may be of a shape other than circular, for example, square or hexagonal.

The abrasive material is dispersed through the plastics material so that abrasive is located at the ends 13 of the projections 12 to form an operative abrasive surface which retains its abrasive properties as the projections are worn down. Similar abrasive particles are located at the surface 15 between the perforations of the Fig. 2 embodiment to form the operative abrasive surface.

The other side of the member to the operative surface is flat and in use this surface is bonded to or otherwise located on a shaped tool (not shown) which holds the abrading member in position. The tool is shaped according to the desired shape which is to be formed by the abrading member. For example, when grinding lenses the tool can have a concave or convex shape and when the member is bonded to the tool it conforms to the shape of the tool due to its flexibility.

The abrasive surface defined by the operative surfaces 13 and 15 should consist of an area which totals in the range 30 to 50% of the total area of the material. The sizes of the individual projections or perforations may be $\frac{1}{2}$ to 10 mm in diameter with a depth of $\frac{1}{2}$ to 3 mm according to the application and the desired working life of the member. The spacing of the projections or perforations affects the flow of coolant over the surface which in turn affects the ability of the coolant to remove the glass particles from the lens as quickly as possible to increase the speed of operation and prevent scratching of the surface being ground by foreign material.

Where the abrading member takes the form shown in Fig. 2 it is particularly suited to circumstances in which the member needs to be thin, for example having an overall thickness of the order of 0.4 mm. In this case the member may be perforated as shown, the perforations being circular or of any other convenient form and occupying up to 50% of the total area of the member. The size of the perforations can vary but it has been found that perforations of $\frac{1}{2}$ mm diameter are suitable. Such a member finds particular application when a high surface finish is required.

The abrading member is conveniently formed by injection moulding in which case an injecting moulding machine incorporates a simple mould in which the desired shape is machined.

The plastics moulding powder, preferably finer than 300 mesh in size, is mixed with abrasive particles and the mixture is lightly milled to ensure a good dispersion. The size of the abrasive particles will vary according to the application but, for example, for smoothing glass lenses the abrasive can have a size of 400 mesh.

Using a bench type of moulding machine, with a heating range of up to 200°C, the heating chamber is charged with the mixture of moulding powder and abrasive particles. After pre-heating the mould an injection moulding process is carried out to provide the illustrated abrading member of homogeneous plastics material in which is dispersed the abrasive particles.

In one method of securing the abrading member to a tool an adhesive is applied over the flat face of the member and a grinding or other tool is pressed against the adhesively coated face so that the member adopts the shape of the tool, which may be convex or concave for lens grinding, and is adhered to the tool and the abrading surface is of the desired curvature. The tool is machined to allow for the thickness of the member so that the member is at the required curvature.

Alternatively a double-sided adhesive tape may be used to secure the member, or a thin pad of wet and dry abrasive is fixed to the tool with adhesive and the abrading member is lain on the abrasive pad and no further adhesive is required. The latter arrangement enables the abrading member to be more readily removed from the tool.

Although lens grinding and smoothing has so far been referred to it will be appreciated that the invention will find application for other abrading operations. Injection moulding is suitable for forming relatively small members but when large surfaces are required the material may be made by rolling the plastics material in sheet form using rollers in which the desired shape and spacings of upstanding projections or perforations are formed. Such sheet material can be used to produce abrading members for use in large or small flat lapping machines, linishing bands, grinding cylinders or a wide range of tooling materials which could use a flexible plastics material containing dispersed abrasive particles. The word, "Linisher" is a registered Trade Mark.

CLAIMS

1. An abrading member comprising flexible plastics material in which is dispersed abrasive particles, the member having one face with an operative surface at which abrasive particles are located, and the plastics material being homogeneous.

2. An abrading member according to claim 1 wherein the operative surface constitutes only a part of the area of said one face.

3. A member according to claim 2 wherein said operative surface is constituted

by the outer ends of a plurality of projections upstanding from said one face.

4. A member according to claim 2 wherein the operative surface is constituted by said one face which is a plain surface in which there are formed a plurality of perforations.

5. A member according to claim 2, 3 or 4 wherein the area of the operative surface is in the range 30–50% of the total area of said one face.

6. An abrading member comprising flexible material in which is dispersed abrasive particles, the flexible material being formed with one face of the material having a plurality of upstanding projections, the outer ends of which act as an operative surface of the member and abrasive particles being located at said operative surface.

7. An abrading member comprising flexible material in which is dispersed abrasive particles, the flexible material having one face defining an operative surface of the member in which perforations or depressions are formed, abrasive particles being located at said operative surface.

8. An abrading member according to claim 3 or claim 6 wherein the upstanding projections each have a flat outer end.

9. An abrading member according to claim 8 wherein the projections are of circular section.

10. A member according to any one of the preceding claims wherein the member is of disc-like form with part-segmental portions radiating from a central portion.

11. A member according to any one of the preceding claims wherein abrasive particles lie flush with said operative surface.

12. A process for forming an abrading member wherein plastics moulding material and abrasive particles are intermixed, the mixture is placed in a mould and the mould is heated to injection mould the material to the desired shape with the particles dispersed in the material.

13. An abrading member substantially as described with reference to Fig. 1 of the drawings.

14. An abrading member substantially as described with reference to Fig. 2 of the drawings.

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